

CLIMATE NARRATIVE: JUNE 2019 and as noted

WEST COAST OF UNITED STATES AND NORTH PACIFIC

Near the end of June 2019, coastal sea surface temperature (SST_{J19}) anomalies were negative in 5-50 km irregular bands, shoreward of neutral to positive anomaly along many sections of the coast south of 43°N. From 39°N to 42°N the coastal bands appear continuous with offshore negative SST_{J19} anomaly that extended more than 1000 km to the west and southwest. Offshore positive anomaly extended toward shore north of 44°N and into the Gulf of Alaska and the Bering Sea. Offshore between 33°N and 43°N, alternating areas of SST_{J19} anomaly were found westward across the North Pacific. Negative anomaly was found off the west coast, south of 42°N, along with a developing stronger positive anomaly ($\leq 2.5^{\circ}\text{C}$) between 140°-160°N that was spatially continuous to the Gulf of Alaska. An area of negative SST_{J19} anomaly occurred from 160°W to 170°E. From there, smaller areas of positive and negative SST_{J19} anomaly occurred westward from 170°E to the Asian coast.

<https://www.ospo.noaa.gov/Products/ocean/sst/anomaly/>

<https://coastwatch.pfeg.noaa.gov/coastwatch/CWBrowserWW180.jsp#>

<https://www.ospo.noaa.gov/Products/ocean/sst/contour/index.html> (current)

During June, negative to neutral (0 to -6 cm) **sea level height anomaly**, SLA, occurred along the coast of North America and south of 30°N, across the North Pacific (NP). West of 160°W, negative SLA (> -10 cm) occurred from the equator to 30°N. An area of positive SLA (≤ 5 cm) centered near 25°N, 120°W extended southwest to 5°N. Positive SLA (≤ 20 cm) occurred in the western Pacific north of 30°N.

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ocean/weeklyenso_clim_81-10/wksl_anm.gif (current 30°S-40°N)

Late June 2019, averaged Aqua MODIS imagery showed coastal bands of surface **chlorophyll-a** (chl-a) between 1-3 mg/m³ along the coast from 33°N to beyond 52°N. These coastal bands were 100-200 km, 200-300 km, 50-150 km wide off the coast at 34°-36°N, 37°-41°N and 42°-52°N, respectively. Coastal chl-a bands were not as well developed off southern California and northern Mexico (30°-33°). Areas of chl-a at 4-12 mg/m³ occurred irregularly within bands of lower concentration.

<https://coastwatch.pfeg.noaa.gov/coastwatch/CWBrowserWW180.jsp#>

<https://coastwatch.pfeg.noaa.gov>

June SST at NDBC Bouys

Near La Jolla, CA, NDBC Buoy number 46225 anchored at 549 meter (m) depth (**32.9°N, 177.4°W**), had average June 2019 SST (SST_{J19}) of 18.8°C with a range of 17.1-20.6°C (17.1-20.6°C). Average temperatures were 17.9, 19.1 19.6°C for the June's first, second and final thirds, noted below as [17.9, 19.1, 19.6°C]. **Santa Barbara Channel** Buoy 46053 (**34.3°N, 119.9°W**) multi-year SST average (SSTa) and SST_{J19} were 15.5° and 16.0 (12.4- 18.7), respectively [14.6, 16.0, 17.4°C]. At the **San Francisco** Buoy 46026, 18 nautical miles (NM) west of San Francisco (**37.8°N, 122.8°W**), SSTa and SST_{J19} were 11.4 and 13.1 (10.2-16.6), respectively [11.7, 13.6, 14.1°C]. At the **Eel River** Buoy 46022, 17 NM WSW of Eureka, CA (**40.7°N, 124.5°W**) SSTa and SST_{J19} were 11.9°C and 11.3°C (9.4-15.5°C), respectively [11.6, 11.0, 11.1°C]. At **Tillamook** Buoy 46089, 85 NM WNW of Tillamook, OR (**46°N, 125.8°W**), the aSST and SST_{J19} were 14.2°C and 14.2°C (12.6-18.5°C), respectively [13.3, 14.1, 15.2°C]. The **Cape Elizabeth** Buoy, 46041, 45 NM Aberdeen, WA (**47.4°N, 124.7°W**) SSTa and SST_{J19} were 13.2°C and 13.4°C (11.8-16.4°C), respectively [13.2, 13.2, 13.8°C]. SST is

measured 0.4-1.0 m below the level sea surface, depending on buoy type.

https://www.ndbc.noaa.gov/station_page.php?station=46028

Ocean temperature at shore stations

The **La Jolla** (32.9°N) **SIO-Shore Station** Program found SST_{J19} near the average of 17°C at the beginning of June. The SST_{J19} and anomaly increased as June progressed to 20°C and 1.5°C, respectively. Multi-year average for June (SSTa) is 18.7°C

<https://scripps.ucsd.edu/programs/shorestations/>

La Jolla Subtidal Water Temperature (STWT), recorded at fixed depth below the lowest tide at tide monitoring stations, had June 2019 mean of 18.2°C with range from 13.3 to 20.6 (13.3-20.6). La Jolla averages during the first, second and third 10-day June periods were 17.7, 18.5 and 18.3°C, respectively [17.7, 18.5 18.3°C]. Southern **Monterey Bay** (36.6°N) average June STWT was 15.3°C (11.8-17.8°C), with [14.4, 14.9, 16.6°C]. **Arena Cove** (38.9°N) average STWT for June was 10.1°C (8.1-13.2°C), with [9.3, 10.9, 10.1°C]. At **Neah Bay** (48.4°N) June STWT average was 11.4° (9.1-13.8°C), with [11.7, 10.9, 11.7].

<https://tidesandcurrents.noaa.gov/stations.html?type=Physical%20Oceanography>

EQUATORIAL AND SOUTH PACIFIC (late June)

During June, El Niño SST conditions weakened as areas of negative SST_{Jn19} anomaly became common east of 130°W and west of 140°E. Eastern equatorial ocean upper 300-meter (m) heat content anomaly was near the climatological average in late June. Positive subsurface temperature anomalies (≤ 1.5 C°) persisted at 0-75 m in the central Equatorial Pacific. Negative subsurface temperature anomalies (≥ -2.0 °C) appeared at 50 m in the east and at 150-250 m in the west. Negative SST_{Jn19} anomaly (> -2 °C) developed in increasingly large areas (10⁴-10⁵ km²) from 120°W to the coast of South America. East of 120°W negative SLA was common in the South Pacific. To the west, areas ($> 10^5$ km) of positive SLA occurred south of 5°S.

https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf

<http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/>

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ocean/weeklyenso_clim_81-10/wksl_anm.gif
(current)

The NOAA **Oceanic El Niño Index** (ONI) (3-month running mean of SST anomalies in the Nino 3.4 region) was 0.7 for the April-January computation, making eight consecutive El Niño-level (≥ 0.5) values.

https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf

The monthly NOAA/NCEI **Pacific Decadal Oscillation Index** (PDO) has recently had 17 consecutive negative or neutral values including 0.0 for June. PDO and ONI indices are recalculated as data are assimilated into the data base.

<https://www.ncdc.noaa.gov/teleconnections/pdo/>

The **Pacific / North American Teleconnection Index** (PNA), computed from atmospheric pressure had a near neutral value (-0.03) for June 2019. .

<https://www.cpc.ncep.noaa.gov/data/teledoc/pna.shtml> (note computational alternatives)

June ERD/SWFSC **Upwelling Indices** (UI) indicated robust coastal upwelling systems south of 42°N, with strongly positive UI anomaly from 39° and 42°N.

<https://upwell.pfeg.noaa.gov/products/PFELData/upwell/monthly/table.1906>

The upwelling favorable conditions at 42°N occurred in during 1-10 and the more intense 14-23 June. <https://www.pfeg.noaa.gov/products/PFELData/upwell/daily/p08dayac.all>

PRECIPITATION and RUNOFF (Late June)

Drought conditions increased from Oregon's north coast into Canada.

<https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?west> Cumulative water-year precipitation totals for California stations remained 100-130% of normal during June 2019. The **Fraser River**, measured 130 km upriver, was flowing at 4,000 m³/s (141,240 cubic feet /sec or cfs). <https://wateroffice.ec.gc.ca> The **Skagit River** near Mount Vernon, WA was flowing at 13,700 [21,200 historical median as cfs in brackets]. The **Stillaguamish River** discharge was 711 [1,090 cfs] at Arlington. **Columbia River** discharged at 165,000 [297,000 cfs] at Vancouver WA. The **Rogue River** in OR was flowing at 3,000 [2,750 cfs] near Agnees. The **Klamath River** near Klamath, CA was transporting 8,340 [6,370 cfs]. The **Sacramento River** transported 15,600 [13,100 cfs] at Freeport. **San Joaquin River** flow was 6,670 [1,780 cfs] at Vernalis.

<https://waterdata.usgs.gov/ca/nwis/current/?type=flow>

https://www.cpc.ncep.noaa.gov/products/global_monitoring/precipitation/global_precip_accum.shtml

<https://www.cnrfc.noaa.gov/awipsProducts/RNOWRKCLI.php=>

NOTES,

In a 2019 article published in "Protecting Natural Resources for Everyone," (<https://nwtreatytribes.org>) K. Neumeyer reports that **juvenile Chinook salmon** are benefiting from the new habitat in the Stillaguamish Estuary, where the Stillaguamish Tribe restored tidal flow (Fall 2017) that had been cut off by 100-year old dikes. This work expands estuary recovery work presently underway by NOAA-Fisheries, the Washington Department of Fish and Wildlife (<https://wdfw.wa.gov>), the Skagit River System Cooperative (<http://skagitcoop.org>) and others to restore salmonid rearing habitat around Skagit Bay (48.2N, 122.5°W). The restored tidal channels within these sites could support hundreds of thousands of additional young ocean bound Chinook salmon.

https://www.fisheries.noaa.gov/feature-story/chinook-salmon-habitat-restoration-washington-sees-positive-results?utm_medium=email&utm_source=govdelivery

<https://www.fisheries.noaa.gov/feature-story/new-mapping-reveals-lost-west-coast-estuary-habitat>

During the last 20 days of June, the *Alexandrium* dinoflagellate, that produces the **Paralytic Shellfish Poisoning** (PSP) toxin, was observed in shore-station net samples at sites from 32°-42°N. PSP toxin was detected in clams and oysters from Sonoma and Santa Barbara Counties. In June *Pseudo-nitzschia* diatoms that produce **Domoic Acid** toxin, were detected at low abundance along the entire California coast and were common at Trinidad Pier, in Tomales Bay, at the Santa Cruz Pier, in Morro Bay, at the San Simeon Pier, and in Diablo Cove. Elevated levels of domoic acid continue in razor clams from Del Norte and Humboldt counties in California. These toxins are also monitored in Oregon and Washington waters.

<https://www.cdph.ca.gov/Programs/OPA/Pages/SN19-007.aspx>

<https://www.cdph.ca.gov/Programs/OPA/Pages/NR16-021.aspx> redtide@cdph.ca.gov

<https://wdfw.wa.gov/fishing/basics/domoic-acid/levels>

<https://www.oregon.gov/oda/programs/foodsafety/shellfish/pages/shellfishclosures.aspx>

This report may be found,

https://coastwatch.pfeg.noaa.gov/elnino/coastal_conditions.html

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